electrically conductive outer structure on the outer surface of the measuring device and on opposite sides of the hand to which the device is attached, the electrode being connected to the measuring unit with a wire inside the wristband.

[0009] Preferred embodiments of the invention are disclosed in the dependent claims.

[0010] The invention is based on providing a measuring device with an electrically conductive outer surface for heart rate measurement on opposite sides of a hand to which the device is attached. This enables a firm and convenient grip to be taken both of the measuring device and the hand to which it is attached.

[0011] The solution of the invention provides a number of advantages. The contact made by both hands becomes reliable and contact impedance is reduced, due to increased contact surface between the measuring device and the skin as a result of an increase in the number of electrodes or in their surface. Also in demanding measuring conditions, the hold of the other hand from the measuring device and the electrodes can be made strong, firm and, as regards the contact force, more uniform. The electrodes are subjected to forces acting from opposite directions, which considerably reduces contact disturbance caused to the electrodes by the movement of the hands, because a decrease in contact force on one side increases contact force on the other side. This way also the reliability of the heart rate measurement is improved.

LIST OF FIGURES

[0012] In the following the invention will be described in greater detail with reference to the preferred embodiments and the accompanying drawings, in which,

[0013] **FIG. 1** illustrates a heart rate monitor of the invention to be attached around a hand;

[0014] **FIG. 2A** is a side view of a plane figure of a measuring device;

[0015] **FIG. 2B** is a three dimensional view of the measuring device;

[0016] **FIG. 3A** illustrates an implementation of an outer electrode forming a semi-circle that extends from the upper side of the hand to which the device is attached to the underside thereof;

[0017] **FIG. 3B** illustrates an implementation of an outer electrode forming a semi-circle that extends from one side of the hand to which the device is attached to the other side thereof;

[0018] **FIG. 4A** is a side view of a measuring device, illustrating an outer electrode implemented on the entire outer surface of the device;

[0019] **FIG. 4B** is a top view of a measuring device, illustrating an outer electrode implemented on the entire outer surface of the device;

[0020] **FIG. 5** is a flow diagram of a method for manufacturing the measuring device; and

[0021] **FIG. 6** is a flow diagram of a method for measuring heart rate.

DESCRIPTION OF EMBODIMENTS

[0022] The disclosed solution will be first examined with reference to **FIG. 1**. A measuring device **100** is attached to a user's hand **150** in the same way as a wristwatch. The measuring device **100** is usually attached to the wrist, although the exact position of the device on the hand is not relevant to the disclosed solution, only the fact that the measuring device **100** can be attached to one of the user's hands **150**. The measuring device **100** of the disclosed solution comprises a measuring unit **102** and attaching means **104**. The attaching means **104** with which the measuring device **100** is attached to the user's arm may be similar to the wristbands of wristwatches. The measuring unit **102** is usually a heart rate monitor or a wrist computer and it comprises a casing containing for example signal processing means for electric processing of signals, a display for displaying information, and a user interface (these being not shown in **FIG. 1**). The measuring device has electrodes **106** and **110** on opposite sides of the hand **150** to which the device is attached. In **FIG. 1** electrode **106** provided on the outer surface of the measuring device is arranged on the measuring unit **102** and meant for contact by the user's other hand **152**. Electrode **108**, arranged on the inner surface of the measuring device **102** in **FIG. 1**, is in turn meant for contact with the skin of the hands **150** to which the measuring device is attached. Electrodes **106** and **108** are electrically isolated from one another.

[0023] Next, the disclosed solution will be examined in greater detail with reference to **FIGS. 2A and 2B**. The measuring device **100** comprises an electrically conductive outer structure **200** connected to signal processing means **204** of the measuring unit **102**. The electrically conductive structure **200** produced on the outer surface of the device may form, for example, at least one electrode **110** which may cover a large part of the outer surface. The outer surface may also comprise at least two electrodes **106, 110**, which do not necessarily cover the outer surface as a whole but, instead, the electrodes **106, 110** may form areas separated from each other by an insulating outer surface. The electrically conductive outer structure **200** may, however, comprise a wire **202** inside the wristband **104**. The wire **202**, which may be a proper electrical wire or a wire made of some other kind of electrically conductive material, such as a conductive polymer, may connect electrode **110** to the measuring device. The wire **202** may also be used to connect electrode **106** to electrode **110**, electrodes **110** and **106** being on opposite sides of the hand to which the measuring device is attached. The wire **202** is coupled to the signal processing means **204**. The measuring device of the disclosed solution further comprises an electrically conductive inner structure **210**, which is also connected to the signal processing means **204**. The conductive inner surface **210** may also comprise a number of separate electrodes **108, 214**. Thus the inner surface **210** may comprise at least one electrode **214** coupled to the processing means **204** with a wire **212** inside the wristband **104**. When at least two electrodes **108, 214** are involved, the electrodes **108, 214** may be coupled together and to the processing means **204** with the wire **212** inside the wristband **104** similarly as in the case of the outer conductive surface **200**. The wire **212** may be a proper electrical wire or a wire made of some other kind of electrically conductive material, such as a conductive polymer.